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ABSTRACT

A mixed media network for information interchange is what we are always likely to have. Amid the current permutations of the storage and distribution media we see the emergence of two trends -- toward the common denominators of electronic display on the TV system and of digital processing and control. The economic implications of a mixed network include operating cost efficiency through a principle of subsidiarity, some likelihood of materials redundancy, and a more miscellaneous equipment investment at local levels. Administrative implications are the complicated accessing, indexing and control procedures required, but these are accompanied by a decentralized utilization pattern with greater total system reliability. In order to facilitate the use of mixed media in networking functions four recommendations are made: (1) for improved standard-setting procedures; (2) for new research and subsidy in the areas of interface devices, the design of media bibliographic tools, and in review of experience gained during the picturephone development; (3) for subsidy of a national system of regional network depositories and (4) for subsidy of selected dual publication ventures assuring input of machine readable and accessible materials at the source, and for demonstrations of such materials in use. (Other papers from this conference are available as LI 003360 - 003376 and LI 003378 through LI 003390) (Author)

THE IMPLICATIONS OF A MIXED MEDIA NETWORK FOR INFORMATION INTERCHANGE

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ABSTRACT

A mixed media network for information interchange is what we are always likely to have. Amid the current permutations of the storage and distribution media we see the emergence of two trends — toward the common denominators of electronic display on the TV system and of digital processing and control.

The economic implications of a mixed network include operating cost efficiency through a principle of subsidiarity, some likelihood of materials redundancy, and a more miscellaneous equipment investment at local levels. Administrative implications are the complicated accessing, indexing, and control procedures required, but these are accompanied by a decentralized utilization pattern with greater total system reliability.

In order to facilitate the use of mixed media in networking functions four recommendations are made:

1) for improved standard-setting procedures.
2) for new research and subsidy in the areas of interface devices, the design of media bibliographic tools, and in review of experienced gained during the picturephone development.
3) for subsidy of a national system of regional network depositories.
4) for subsidy of selected dual publication ventures assuring input of machine readable and accessible materials at the source, and for demonstrations of such materials in use.

The Implications of a Mixed Media Network for Information Interchange

A mixed media network for information interchange is not something that we shall have to look far into the future for. It is what we have now — or potentially have — and it is what man has had experience with all through his history. It includes or has included at one time or another, the media of mail, messenger service, print, pneumatic tube, carrier pigeon, clay tablets, and a nearly endless series of other devices.

Our experience with the mixed media development has shown that its elements are constantly subject to recombinations, to mutations, to revitalization and unexpected proliferation with hybrid vigor. Even among our own modern media we see 2x2 slides appearing now with magnetic sound additions, 8mm film appearing in cartridges with sound or in Super-8 form, quarter-inch audio tape appearing in cartridges and cassettes, TV tape also beginning to appear in cassette form. In addition to these reappearances of old media in new form there are constant appearances of radically new media — holograms, for instance. Before we fully explore the potential of the older media there are newer ones crowding them.

In view of our past history, therefore, we may suspect that our choice is not between a mixed media network and an unmixed one. We may safely assume that we will always have a somewhat mixed system, try as we will to unmix it and to come to some common denominator. Our choice seems to relate more to the question of how gracefully or efficiently we are prepared to live within the mixed media system. There are things that we

can do — standardization, for instance — that will considerably relieve the difficulties of mixed media operation. There may also be steps that we must take to reduce the confusion in such a system and to keep the mix within manageable bounds. Like Lewis Carroll's Alice, we have to run as hard as we can just to stay in the same place.

One of the questions constantly posed by a mixed media system is the flow question. How do we get from here to there? How do we transfer a store of information from one medium into another storage medium? How do we transmit retrieved information from a given storage deposit to a user in a remote location? The latter type of question frequently becomes a matter of electronic band width in which we juggle the variables of resolution or fidelity, time, and money, much as the electric power grids juggle voltage and amperage. In other words, thirty frames of television pictures per second requires a broad capacity transmission, whereas a single frame every ten seconds allows us to achieve the transmission with a much narrower band.

This double flow of information, between storage systems and between a given storage medium and the user, seems to divide the media logically into those used primarily for storage and those used primarily for distribution of information. The modern storage media include such as these: for audio — phonograph records and magnetic tapes; for video — print and graphics, photographs, slides, film, videotape, facsimile, electron beam recordings, and holographs; for digitalized data — computers using disc, tape, drum or core memories. The distribution media include

the mail, AM and FM radio, telephone, teletype, picturephone, TV microwave, TV cable, TV broadcast, satellites, slow-scan TV, and lasers.

Apart from the daily operational flow among and between these various media there seems to be present, as well, a kind of design flow or trend toward reaching at least two common denominators: electronic and digital. These meeting points of so many media are to be seen particularly in the frequency with which their display or terminus turns out to be the standard television set or the computer's cathode ray tube. At times there is even an occasional hint that these terminus points may eventually be combined or consolidated into a single instrument.

The trend toward TV display is to be seen even in the area of still pictures. There has recently been introduced a slow-scan visual delivery system enabling us to send slides over FM radio — with audio accompaniment and with student feedback options. The obvious economies of such a system are being stressed by its marketers, Educasting Systems, Inc.[1]

Audio also advances toward the TV terminus: the dial access audio system originally introduced by Ampex at the Oak Park-River Forest High School in Illinois is now being extended to a dial access video capability in which still pictures are retrieved on TV sets either independently or along

[1]Jones, Stacy V. "Illustrated Lessons Sent by an FM System," New York Times (20 June 1970) p. 37.

with the audio. This system is based on a master loop or "bin" storage system using 1-inch magnetic tape with 32 tracks for audio and on a video master storage which uses the magnetic disc recorder coupled with disc "buffers" for dubbing off the program selections for individual display.[2] This "Pyramid" system is also partially paralleled in the same company with a "Videofile" system for document storage and retrieval.[3] In Videofile, which has found applications with regard to railroad waybills, insurance records, law enforcement records, and in other areas, the documents are magnetically recorded and coded on two-inch videotape, then searched by a computer and reproduced for examination by means of a magnetic disc buffer and a television screen. Hard copy printout is available through an electrofax process whenever the image on the screen needs to be fixed in such form.

These Ampex systems, again, clearly have the standard television screen as their common denominator, and they should offer no great problems of compatibility with other systems which meet them at this same point of delivery.

Westinghouse Learning Corporation, for instance, has another system which does much the same job as the Ampex "Pyramid" but in a somewhat different way. It delivers dial access audio and still pictures, but it bases

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[2] Kuljian, Maynard J. "A Random-Access Audio-Picture Retrieval System," Journal of the Society of Motion Picture and Television Engineers (Oct. 1969) pp. 68-71.

[3] Steinberg, Charles A. "Information Storage and Retrieval System," Information Display (Feb. 1970) pp. 25-28.

its rapid delivery not on high speed dubbing as Ampex does but rather on an audio compression process which permits many segments of audio to be recorded on 1-inch videotape. Like the Ampex system, the Westinghouse one uses a magnetic disc buffer for individual program delivery to the TV sets.

These Ampex and Westinghouse systems may also be pointing the way around the fiasco of the helical scan incompatibility. The hodge-podge of competing standards in the 1/2-inch and 1-inch videotape recorders has long been a horrible object lesson in how a mixed system becomes a mixed-up system. Now perhaps the way is opening not so much for salvage of the medium as for a by-pass around the mess. This new hope is represented by the magnetic disc buffer. We used to assume that vast libraries of tapes in a given format ideally ought to be available for making dubs to be used in the same format — although such media libraries as the Great Plains one have long since found ways of living within the helical scan jungle by equipping themselves with a great many different brands of machines and thus offering dubs onto the customer's tapes from almost any format to almost any format. Now with the possibility that the dubs onto magnetic discs will be remotely accessible via cable TV or other networks and thus recordable into whatever format one has locally, the way around the basic equipment incompatibility appears to be simply to relegate local recorders to holding and scheduling functions. The intercampus microwave network has also found a similar solution: the same basic lecture going down the backbone of the system may be tapped off and held in any combination of

formats at the local institutions, provided those institutions do not expect also to use their recorders to make input to the system. In other words, the "off-brand" equipment reduces its buyers to a receive-only capability. To an objective observer that may not appear to be a crucially significant limitation, but it sometimes turns out to be such in fact when the faculty at the local institution makes clear its staunch adherence to the Christian concept that it is more blessed to give than to receive — at least where television is concerned.

Another hopeful sign in the Ampex and Westinghouse systems is the fact that they do not rule out the possibility that the same TV set which is their display device for still pictures may at other times be used for display of live television or conventional television program recordings from magnetic tape or film or newer processes such as Electronic Video Recording or SelectaVision. We might call this a kind of compatibility — tandem compatibility, perhaps. If we cannot play EVR into the Pyramid system or vice versa, at least they can come out at the same place on the standard TV set, alternately.

The Electronic Video Recording system of CBS Laboratories uses a special thin film, 8.75mm in width, for electron beam recording of programs originally produced either in standard film or TV formats.[4] The player of the sprocketless and automatically threaded film feeds directly

[4]National Cable Television Association Membership Bulletin, 11:32 (19 Aug. 1969) p. 4.

into a standard TV set. The player is made and marketed by Motorola for less than $800, and the programs — billed as the video long-playing record — are to be made in the CBS Labs for less than $18 apiece when ordered in batches as large as 200 (of 30-minute length). Each of the 7-inch diameter EVR cartridge reels represents a picture potential of 187,200 frames, and the company is reported to have under development a Reference EVR adaptation which will offer page storage with random access retrieval. Special publication in the medium so as to use the TV screen for the reading of enlarged type is possible even earlier.[5]

Recently RCA has announced its SelectaVision system which incorporates holographic video recording and laser beam reproduction in a player designed to sell for less than $400.[6] It uses a very cheap, clear plastic film for its transfer dubs of film and TV materials and promises a library of selections that will retail for about $10 per half hour of color program. Again, practically the only point on which it reaches compatibility with the EVR system lies in the fact that it will play into the same standard TV set.

One is reminded of an earlier competition between CBS and RCA — that of the long playing audio disc recording: the battle of the big-hole 45 rpm records with the little-hole 33-1/3 rpm units. We may hope that our public welfare and patience will not be so ill served again. Destructive

[5]Gould, Jack "Books Reproduced on TV Cartridges," New York Times (14 Apr. 1970).

[6]RCA News Release (30 Sept. 1969).

competition by great industries should be headed off by a strengthened process of standard setting in the public interest whenever possible, and even the federal anti-trust authorities should be encouraged to promote cooperative standard setting by industries whenever this would be more largely in the public interest than would the generally unrestrained competition. Just as some areas of trade might need to be built up by judicious exceptions or relaxations of the general anti-trust rulings, so the areas in which the evolution of cooperative standards would be likely to benefit the general public ought also to be marked out by the anti-trust authorities for favorable treatment.

However, if CBS and RCA can find no larger interface between EVR and SelectaVision than the standard TV set it is possible that a further common denominator may already have appeared from outside these companies in the color VTR cartridge machines recently demonstrated by Sony and Panasonic.[7] There is no assurance, as yet, that these Japanese companies will achieve compatibility between their own developments, although both have gone to some length to insure compatibility with certain European manufacturers. There has also been evident, of late, a very salutary government pressure toward compatibility in Japan. With the basic units of almost all videotape recorders now being manufactured in Japan we may find eventually that the compatibility which our native American

[7] see Panasonic announcement in Training in Business and Industry, 7:2 (Feb. 1970) p. 47.

industry has found so hard to achieve will arrive here with the label, "Made in Japan." At any rate, the Sony and Panasonic units are rumored to be aiming at a price range, per unit, as low as SelectaVision, with a half hour of color recording made possible on a half-inch (at least with Panasonic) tape cartridge giving single-copy economy much lower than either EVR or SelectaVision.

Traditional photographic processes have also found ways of adapting to the age of data storage and retrieval — for example, the Eastman Kodak Company's "Miracode" system, using 16mm cartridges in 100-ft. lengths with 2400 frames each, machine accessible.[8] Index data is interspersed in optically coded frames using a binary system of clear and opaque bits of space so that a retrieval station may punch up and run the cartridge to the required frame within ten seconds. The reading machines can be equipped to provide hard copy print-out of entire pages within a very few seconds. Both color and black-and-white visuals may be included in the system. From such storage the first distribution medium that has traditionally suggested itself has been the mail, but it is also clear that the system would be easily adaptable to access by television projectors or flying spot scanners. The binary system of coding suggests, also, that some interface with computerized indexes should not be too difficult to achieve.

In the computer field there has been a long succession of

[8]Miller, R.K. "Quick Access to Land Documents via 16mm Microfilm File System," Electrical World (4 Aug. 1969).

developments offering easy file conversion from punched cards to paper tape to magnetic tape to magnetic cores, drums and discs. Now there is report of a breakthrough in the offing that will use an erasable hologram memory or polarized light for storage of digitalized information and thereby achieve a capacity of 100 million bits per square inch. However, until computers generally arrive at a far greater and more economical storage capacity than they have at the present time it seems likely that bulk storage of documents themselves — as differentiated from abstracts and indexes — will have to make use of various forms of graphic or magnetic storage, including photographic, electron beam, videorecording, or holographic. Indexes and abstracts, along with control functions, are well within the capability of present generation computers. It is therefore of great importance to make provision for adequate interfaces from each of the storage systems into the digital computer.

A number of two-way audio developments have recently given us other examples of media acquiring further impetus and life from new applications and combinations of old services. An instructional FM radio service at Stanford University sought and obtained FCC approval for a classroom radio feed-back link to the originating studio.[9]

Meanwhile, the development of two-way amplifiers for CATV installations has opened up the possibility that interactive television may

[9]Morris, Albert J. "University-Industry Television, Radio and Telephone Lines," Educational Broadcasting Review 4:1 (Feb. 1970), p. 49.

be available for home use in the near future. Such a development is being encouraged and hastened by recent FCC rulings which offer the opportunity for massive cable TV expansion at the price of new service explorations and payment of a five percent gross receipts royalty for subsidy of public television.[10] Viewer responses from individual sets could, with computer coding and access to data banks, turn a television system alternately into a device for programmed instruction or a town meeting or shopper's guide or a library console.

The leadership of the Corporation for Public Broadcasting and other educational agencies (National Educational Television, National Association of Educational Broadcasters, National Education Association, and the Joint Council on Educational Telecommunications) in securing the pioneer use of domestic satellites for educators has also extended the potential of audio response from ground cable to satellites. In fact, CPB has even more recently requested the reservation of Instructional Television Fixed Service frequencies for satellite communication; so the audio response development which we have already noted in ground-based radio may ride along automatically now in the satellite application.

Facsimile services are among the oldest media beginning to take on new impetus at this time. An early facsimile system had appeared in the mid 19th century only to be stunted by the competition of the telegraph. Then, after World War II, a facsimile system using FM radio was born only

[10]New York Times (26 June 1970) p. 71 and (27 June 1970) p. 45.

to be blighted by the age of television.[11] Now new applications for facsimile are appearing from the fact that it seems to offer an easy interface between graphic information and digital transmission plus the fact that it is adaptable to radio, television, and even satellite transmission. A newspaper in Japan is sending its pages via radio facsimile from Tokyo to Hokkaido and is running tests on the reception of the New York Times via satellite facsimile.[12] RCA in New York has successfully demonstrated a method of transmitting facsimile printed matter over a standard broadcast TV channel without interference with the regular programs.

Such intersecting and cross-pollinating media are the prospective components of a mixed media system that is at once richer, more redundant, more wasteful, more surprising and confusing, and more inevitable than any unmixed system could be. Everything seems to be pointing toward the enormous potential today of linking such media together into a flexible mixed media system for information interchange, a system that would explore many of the untapped potentials of such media: the design flow is right for such a move, the availability of distribution media is prospectively enormous, the national policy is encouraging. The implications of this type of system for information interchange may be grouped generally under economic and administrative headings.

The economic implications are far more than monetary — for they

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[11]Axner, David H. "The Facts about Facsimile," Data Processing Magazine, 10:5 (May 1968) pp. 42ff.

[12]New York Times (8 April 1970) p. 7 and (30 June 1970) p. 3.

include that basic economy of means which is a key principle in the attainment of efficiency and quality of performance. A mixed media system necessarily implies by the very survival of the mixture that each element has a certain irreducible advantage to offer. Even before we reach complicated questions of transfer and cross-media reinforcement, or the possibilities of contrapuntal media utilization in instruction, for example, there is the simple and obvious fact that if each medium is used precisely in the area of its greatest specific advantage there will result an over-all efficiency of operation which should produce the highest quality result at the lowest cost in effort and money.

From another point of view this matter of efficiency and economy of operations in mixed media systems might be said to imply a principle of subsidiarity: in general using the simplest means available for a given end and thus avoiding situations in which relatively simple material is transmitted over relatively complex media merely because such media are available. The classic example of the thing to be avoided is the instructional television lecture in which the fundamental requirement of the material is for a verbal statement in which an audio transmission would be adequate.

A mixed media system also clearly implies a relatively miscellaneous set of equipment at local institutions. It requires us to forego the utopian dream of the single black box that can do everything. It means that our libraries will need more kinds of listening stations, more viewing and display devices for tapes, microforms, slides, 8mm cartridges, EVR or SelectaVision cartridges, videotapes, etc. It means that our libraries will

continue to expand their functions as sound and picture as well as book depositories — or, at least access points for these.

Having this great mass of media continuing to exist and function side by side will also mean a greater degree of redundancy among them. The same still pictures in color may be available in both photographic and magnetic devices, the same motion pictures in both film and EVR cartridges. However, such overlapping of media may also lead to more highly individualized uses and greater flexibility and creativeness in user adaptation.

On the administrative side such a mixed media network will present more persistent problems of access, indexing and control at the local level, but at the same time it will have the advantages of greater autonomy and decentralization. If it is valid to draw a parallel between the electric power grid and the information network of the future we may conclude that a somewhat greater total reliability is to be anticipated in the relatively decentralized structure.

The fact that the mixed system will not depend on any startling breakthroughs but will include many of the present media with which we are familiar is also a fairly good assurance that the mixed system will offer an easier introduction for its users, a more tranquil evolution, and possibly a more extensive pattern of utilization. While it is true that media will not be used unless they are made available, it is unfortunately not so certainly true that making media available will necessarily lead to their effective utilization. Mass transit authorities have often found that merely providing a cheap, efficient and fast transport system is no guarantee that

people will use it in sufficient numbers to make it pay. In the media field, also, we have seen broad band telecommunication networks linking campuses together over wide areas for years assuring scholars of their availability for library facsimile transmissions, and yet they go on transmitting television lectures almost exclusively. Obviously even the most modern media do not escape the elementary facts of human inertia and habit. However, the mere convenience implied in making more means available to more people at the local level should lead to a greater total utilization.

The kinds of utilization will also change. New and unforeseen uses must be expected to emerge. The mixed media network will not simply lead to the accomplishment of the same old tasks in new and better ways. It will lead to the discovery and addition of new goals on top of the old ones; just because the new ones suddenly appear to be possible.

A mixed media situation offers its administrators a relatively complicated bibliographical indexing and control process. They will have to know where the pictures, films and tapes are, how to get at them, what is in them, how to index them. Something very radical is implied in all of this. We know how to index books, but how do you index pictures? By a verbal description of what they contain, or by a truly pictorial representation — or some combination of the two? Along with the technological interface between media we need to develop what we might call transmedia analogs. And here we are up against the ancient problems of synaesthesia. The ears and the eyes of men represent two senses with certain areas of radical and perhaps irreducible difference, even though we reduce them physiologically

to similarly transmitted impulses in our nerves. There are interesting experiments with television grids projected onto the skins of blind men in order to enable them to feel a kind of vision, and yet the sound and the picture fringes of our libraries continue to present us with enormous problems of day-to-day bibliographic integration. There is no advantage in delivering the typewritten card by means of facsimile print-out a hundred miles away if the necessary visual indexing is not on the card to begin with.

The prospect of living indefinitely with a mixed media system should bring us to face certain needs which are inherent in such a situation, needs which include standards, new research, depositories, and demonstrations. These four areas of need lead me to recommendations for steps to cope with them:

1. There should be launched a comprehensive study leading to the design of improved standard setting procedures for the U.S. Something is radically wrong with present procedures which have allowed us to enter the helical scan morass and apparently to be unable to extricate ourselves from it unless it be by default to foreign systems. We need to pinpoint the reasons for our difficulties and the steps needed to take us out of them and to prevent their recurrence in future developments. Granted that we want to protect the great advantages of the free enterprise system and the glorious proliferation of competing devices, we may also need to give more direct protection to our common good. We are finding this to be true in other areas — environmental pollution, for instance. There it seems that a great

many competing industries operating in our free enterprise system have somehow failed to take adequate account of our common good. Where so many are so intent on their private profit it may be that the common good does not automatically accrue without someone to speak for it. We are likely to find that fact to be equally true in the field of technical standards.

We need this study to probe very carefully into our recent history in the matter of standards. How could the long-playing record war have been avoided? Is it true that the American electronics industry has simply shown insufficient interest in arriving at standards for helical scan recorders, each industry giant naively confident that its system would win out in the end or at least box off a large enough segment of the market to be profitable — regardless of the inconvenience and limitations for their customers? Is it true that fear of the federal anti-trust authorities inhibited many industries from having conversations with others about standards? Have the American National Standards Institute and such standards generating agencies as the Society of Motion Picture and Television Engineers been crippled by inadequate funds to get the job done?[13] If it is true that our standards are necessarily industry-generated is it not still possible to achieve a stimulus role for government, something less arbitrary and indirect than the present buying power of the Department of Defense? If we can evolve a revision of our copyright law more in harmony with the international scene, can we not harmonize our standard setting procedure with the international practice?

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[13] "Symposium on Video-tape Recording Standardization," SMPTE Journal, 7:77 (July 1968) pp. 737-46.

The study of such questions ought to call upon the expertise of many agencies — the Standards Institute, the Society of Motion Picture and Television Engineers, Justice Department, Commerce Department, Bureau of Standards, Library of Congress, American Library Association, the National Commission on Libraries and Information Services, Corporation for Public Broadcasting, National Institutes of Health, National Institutes of Education, U.S. Office of Education, Department of Defense, Electronic Industries Association, and many others. The study might be undertaken by almost any of these — or by others, such as the Rand Corporation, on contract; but the dimensions of the problem require a funding of at least three to five hundred thousand dollars.

2. When it becomes apparent that competitive industry has allowed an interface gap to develop in some area, there ought to be an agency in a position to research design, and partially subsidize new interface devices. For instance, in spite of our great present trend toward TV distribution, where is the projector that can be used to input 8mm cartridge films into TV systems? Or, can the Reference EVR reader be designed so as to accommodate Miracode cartridges, as well? (There are reports of a Broadcast EVR version in 16mm; if this comes out, and if Reference EVR were compatible with it, would there also be a chance for compatibility with other 16mm systems?)

We also need additional research to develop designs and recommended practices for catalogs and machine readable indexes of media materials. Before we can have the logical starting tools for

networking we need to design the tools. These should be developed as compatible extensions of standard bibliographic tools, thus insuring integration with central catalogs rather than isolation as special media resources.

There is already beginning what is certain to be a most interesting pilot prototype for a national information network: the picturephone development.[14] Here are many of the parallel problems and techniques to be mastered: TV-computer interface, alternate CRT and TV use of a picture tube, two-way interaction, switching, directory publication, standardization, evolution through processes of consumer experience and demand. Information utilities may be born as a spin-off. All of this experience needs to be studied and applied through the persistent review of a national agency. Perhaps the new National Commission on Libraries and Information Services is the proper agency to undertake such research, subsidy, and review functions.

We have recently seen in the space program a striking demonstration of what industries can accomplish when they are given adequately defined goals: film, radio, and TV technology combined to do what would have been regarded as impossible until very recently, putting high resolution pictures of the moon and Mars into digitalized form, transmitting them over narrow band widths for very long distances, and then reconverting them to pictorial form, transmitting live color television pictures from

14Janson, Donald "Picture-telephone Service is Started in Pittsburgh," New York Times (1 July 1970) p. 1.

the surface of the moon with low-power, compact devices of small weight. After such achievements it appears that all the library networking problem requires is adequate specification and definition — along with an operating authority backed by adequate appropriations to get the job done. A national network of libraries might be quite efficiently set up and run by an organization equivalent to NASA. The only problem with this is that libraries are far closer to the sensitive nerve of our nation than is the surface of the moon. A national library network operated by a government agency would surely raise fears of thought control, and this fact has clearly been taken account by Congress in setting up the new National Commission as an independent agency rather than an arm of HEW. The actual operation of network services is better left to decentralized and regional units.

3. We need stimulation and subsidy for comprehensive and interconnected regional network depositories. The original conception of the regional educational laboratories and the operational experience of the ERIC centers would be pertinent parallels here. Not only would geographical regions be served by the decentralized units, but these should also ideally be committed to dividing up the total task into specific areas of specialization. Thus each regional unit would be the national depository in specific subject areas, and the nation at large would be flexibly served by the interconnections between all regional units.

4. We need a subsidy program for selected mixed media publication and for demonstrations and pilot operations using mixed

media — with a built-in provision for disseminating information about these ventures. The fact that we are now poised for a great expansion of cable television is one auspicious factor involved here. Another is the fact that traditional publishing of textbooks is encountering difficulties at the present time and seeking new solutions.[15] The surest long-range solution to the input problem in library networking is to gain the cooperation of the original publishers — insuring a dual form of publication, one traditional and one machine readable.

[15]Raymont, Henry "Publishers Report a Decline in Sales of Textbooks," New York Times (14 May 1970) p. 75.
cf. also Bailey, Jr., Herbert S. "Book Publishing and the New Technologies," Saturday Review (11 June 1966) pp. 41ff.

BIBLIOGRAPHY

Axner, David H. "The Facts About Facsimile," Data Processing Magazine 10:5 (May 1968) pp. 42ff.

Bailey, Jr., Herbert S. "Book Publishing and the New Technologies," Saturday Review (11 June 1966) pp. 41ff.

Baruch, Jordan J. "Interactive Television: A Mass Medium for Individual," EDUCOM Position Paper (Oct. 1969).

Carnegie Commission on Educational Television, Public Television, A Program for Action. New York: Bantam, 1967.

"Document vs Digital Storage of Textual Materials for Network Operations," in EDUCOM Bulletin 2:6 (Dec. 1967).

Dordick, H.S.; Chesler, L.G.; Firstman, S.I.; and Bretz, R. Telecommunications in Urban Development. Santa Monica: Rand Corp. July 1969 (Memorandum RM-6069-RC).

Educational Media 1:8 (Dec. 1969-Jan. 1970).

Federal Communications Commission. Federal Register 33:247 (20 Dec. 1968) pp. 18977ff. (Docket No. 18397).

Industrial Electronics Division. Electronic Industries Association. The Future of Broadband Communications. Response to FCC Docket 18397, Part V. (29 Oct. 1969).

Johnson, Leland L. The Future of Cable Television: Some Problems of Federal Regulation. Santa Monica: Rand Corp. (Jan 1970). (Memorandum RM-6199-FF).

Kuljian, Maynard J. "A Random-Access Audio-Picture Retrieval System," Journal of the Society of Motion Picture and Television Engineers. (Oct. 1969) pp. 68ff.

Miller, R. K. "Quick access to land documents via 16mm microfilm file system," Electrical World (4 Aug. 1969).

Morris, Albert J. "University-Industry Television, Radio and Telephone Links," Educational Broadcasting Review 4:1 (Feb. 1970), pp. 44ff.

National Cable Television Association Membership Bulletin II:32 (19 Aug. 1969).

New York Times issues of Apr. 8, Apr. 14, May 14, June 20, 26, 27, and 30, and July 1, 1970.

"RCA Achieves Major Technological Breakthrough in Development of Color-TV Tape Player Employing Lasers and Holography," RCA News Release (30 Sept. 1969).

Steinberg, Charles A. "Information Storage and Retrieval System," Information Display (Feb. 1970) pp. 25ff.

"Symposium on Video-tape Recording Standardization," Society of Motion Picture and Television Engineers Journal 7:77 (July 1968) pp. 757ff.

Taylor, Robert S. "Technology and Libraries," EDUCOM Bulletin 5:3 (May 1970) pp. 4ff.

Training in Business and Industry 7:2 (Feb. 1970) p. 47.